Questions raised at the South Dunedin Water Hui, 12 August 2019

and responses from the Dunedin City Council, GNS Science and Otago Regional Council

Number	Question	Hui Session	Topic	Organisation answering	Reply
1	Is the budget sufficient? Will there be enough money?	One	General	DCC	The short answer is, we don't know yet. We have budgeted a total of $86 million over the next 10 years for major projects which will reduce stormwater and wastewater flooding in South Dunedin. Along with the Otago Regional Council, GNS Science and other organisations, we are currently collecting groundwater data and other technical data to help inform what the longer-term adaptation options might be. Results of these investigations will help us to develop a holistic plan and detailed budget to improve the management of stormwater flows and high groundwater levels in the area.
2	Why not start buying out and moving residents now? With projected sea level rise, at some stage we will need to go beyond infrastructure changes anyway.	One	General	DCC	At this stage, all options remain on the table. Our current focus is on actions that will reduce flooding in the short term, while developing options for adapting to the medium to longer term climate-driven challenges facing South Dunedin. Long-term adaptive planning work will take several years to complete, and the community conversation will be ongoing. We believe there is time to do this work in a careful and considered way, and in partnership with the community.
3	What urgent measures does DCC have for Kettle Park?	One	General	DCC	DCC has installed an erosion protection barrier (made out of large sand bags) at Kettle Park and will continue to closely monitor the situation. If required, DCC is capable of creating a larger barrier or drawing on a range of other options, such as importing additional sand, building a rock wall or proactively removing some of the rubble located in the dune. We will continue to work closely with the expert team that we have brought together to manage this event.
4	Is there any reason Kaikorai waste can't remain in pipes at the bottom of the stream so that it is never mixed with stormwater?	One	Kaikorai stream project	DCC	Currently the main wastewater pipe in Kaikorai Valley follows a similar path to the Kaikorai Stream. At times the pipe is very close to the stream and crosses under the stream. As the pipes age there is an increasing risk of the stream leaking into the pipe or the wastewater in the pipe leaking into the stream. For this reason, where possible, we try to put some separation distance between wastewater pipes and streams. Putting a wastewater pipe at the bottom of the stream can be risky because as the pipe gets older it can leak into the stream or the stream can leak into the pipe. Having a wastewater pipe at the bottom of the stream also makes it difficult to repair the pipe if there's a problem.
5	Is it possible to separate toilet waste from other waste water?	One	Kaikorai stream project	DCC	Yes. Some household systems separate the water from your bath, shower, basins, kitchen and laundry into "greywater", separate from the toilet waste. The greywater can be reused for irrigating plants and gardens.
6	How diluted is the wastewater (from stormwater) going into the stream?	One	Kaikorai stream project	DCC	In heavy rainfall a lot of stormwater and groundwater gets into the wastewater pipes. It can dilute the wastewater to as much as 1 part wastewater to 10 parts stormwater. If this were to be diverted into the Kaikorai Stream the overflow water is diluted in the stream by about 1 part diluted wastewater to 30-50 parts stream water. So the total dilution is around 1 part wastewater to 300 - 500 parts stream flow.
7	Have you looked into using micro tunnel boring machines to repair the sewerage pipes?	One	Kaikorai stream project	DCC	Depending on the condition of the existing pipes and their capacity to contain future flows, there are many options for how these are repaired or replaced. Methods can include digging trenches and repairing/installing new pipes or using trenchless methods, of which one of these is micro tunnelling. We work with our consultants and contractors to find the right pipe repair and installation methods for different circumstances and microtunnelling is one that we consider.
8	How old are the sewerage pipes?	One	Kaikorai stream project	DCC	The oldest sewerage pipes in the Kaikorai Valley area were installed in 1914, making then 105 years old - these pipes are clay earthenware. The newest sewerage pipes in the Kaikorai Valley area were installed in 2016, these are made from PVC. The majority of pipes were installed between 1914 - 1930 with some around 1950-1960, and then pipes that have replaced older pipes installed in the last five years.
9	How long is the process of each stage projected to take?	One	Kaikorai stream project	DCC	Timeframes will depend on the design of the overflow and what level of treatment the overflow will receive before discharge. We intend to apply for resource consent for the temporary Kaikorai Valley wastewater diversion within the next 6 months. If resource consent is approved, it will take about 6-9 months to complete the design and engage a contractor, and a further 6-9 months to construct. Construction of the permanent pipe from Kaikorai Valley to Green Island is expected to take place from 2023. Preliminary work and design of the Green Island Wastewater Treatment Plant is likely to take two years, with construction to start in 2024 and take about 2 years to complete. $35m is also budgeted for flood reduction in South Dunedin over the next 10 years. It is likely the next 3-4 years will be focused on planning, design and research, to determine how this money could best be spent. In the short term, we've identified some opportunities to remove bottlenecks from our stormwater network at Forbury Road and Portobello Road. Addressing these has the potential to significantly improve the stormwater system in South Dunedin. We're in the process of further investigation of these, with work potentially taking place from 2021.
10	What happens to the old pipes?	One	Kaikorai stream project	DCC	Typically, when new pipes are installed, the old ones are left in the ground. Depending on their condition they are either left as they are so that other utilities (e.g. telecommunications, electricity) can use the pipes to run cables inside of, or they are filled with grout to prevent them collapsing and making the ground surface uneven. Sometimes the old pipes are removed from the ground and disposed of at the landfill.
11	Where does the Kaikorai stream run out to?	One	Kaikorai stream project	DCC	It eventually enters the ocean at Waldronville, where its outflow is a lagoon known as the Kaikorai Estuary.
12	Will there be consultation with the Brighton community?	One	Kaikorai stream project	DCC	Public consultation on the proposed Kaikorai wastewater overflow is planned as part of the process. Investigation and feasibility work needs to be completed before consultation takes place. We will publicise opportunities for people to have their say as appropriate.
13	Bigger pipes? Why?	One	Kaikorai stream project	DCC	Bigger pipes are one of many options being considered for reducing flooding in South Dunedin. Bigger pipes are more expensive so we need to confirm whether they are the right option before going ahead. Other options could include things like holding the water in detention ponds, creating open channels, etc.
14	What do you realistically think the chances of ORC giving consent to discharge into Kaikorai Stream?	One	Kaikorai stream project	DCC	We will follow the resource consent process, but it isn't appropriate for us to speculate on the outcome of this process.

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15	What impact will there be on Kaikorai Stream and the ocean with the pumping/diversion of wastewater into these waterways?	One	Kaikorai stream project	DCC	Clearly, discharging a large amount of wastewater, albeit heavily diluted and screened, into a stream, will have some impact on the environment. This new proposal would send screened wastewater into the Kaikorai Stream and help prevent wastewater flooding and contamination in South Dunedin. This certainly isn't intended as a permanent or ideal solution. However, we believe that the benefits to human health and wellbeing outweigh the environmental impacts in this situation, until the permanent solution has been constructed.
16	Environmental impact on Kaikorai Stream, cultural? swimming safety and sea water quality?	One	Kaikorai stream project	DCC	The Kaikorai Stream is currently in poor health and is not safe to swim in. The poor stream health and the dilution that occurs to the wastewater when the discharge would take place mean that the diluted wastewater has a minor impact on the water quality and biology in the waterway and ocean. The impact on cultural values is significant. Manawhenua from the Ōtākou area have a long history of association with the Kaikorai Stream and estuary which was historically a mahinga kai and recreational area. It is currently unsafe for those activities and the long term vision of mana whenua is to restore the area so that these activities can take place once again.
17	If Kaikorai option goes ahead, how much of the H2o will be diverted from South D?	One	Kaikorai stream project	DCC	It's estimated that up to 500 l/s of diluted wastewater could be diverted from South Dunedin if the Kaikorai option goes ahead. If the proposal went ahead, sensors would be installed in the Surrey Street/Hillside area so that the Kaikorai Valley overflow was only activated when absolutely required to help protect human health.
18	How high are we willing to defend against sea level rise? What amount of money will be a viable investment?	One	Retreat options	DCC	Although we are beginning to see the impacts of climate change, there is time to adequately plan and adapt. There is no preplanned financial limit. It will be an ongoing process of discussion and evaluating alternatives in partnership with the community, the city as a whole and central government.
19	Why is DCC not talking about the probable reality of people having to move from South Dunedin?	One	Retreat options	DCC	At this stage, all options remain on the table and there is time to explore all options, with the community, in a careful and considered way. There is significant investment in South Dunedin already, and more planned. At the same time, we do need to be considering planning options that look at relocation possibilities, for at least parts of the community.
20	How prepared are we for where the people of South Dunedin will need to go?	One	Retreat options	DCC	See answer above (#19)
21	What about people who are renting?	One	Retreat options	DCC	At this stage, all options remain on the table and there is time to explore all the options, with the community, in a careful and considered way. We recognise that renters are in a unique situation when it comes to preparing for climate change and they will be included in discussions around long-term options and pathways, along with property and business owners.
22	SD suits people with limited mobility, where do they go?	One	Retreat options	DCC	Again, at this stage, all options remain on the table and there is time to explore all the options, with the community, in a careful and considered way. We have not yet done any work on how or where a managed retreat would occur.
23	What about the schools, rest homes, and social services in the area?	One	Retreat options	DCC	See above (#22)
24	Mitigating coastal erosion is very important, so what plans are in place? - Will there have to be evacuations?	One	St Clair	DCC	We are about to begin a piece of work that will allow DCC and the community to work together to develop an adaptive management plan for this coast. The purpose of this work is to enable DCC to be proactive in managing the coast and to set out short, medium and long term actions for the management of the coast. We do not currently believe that there will be need for evacuations.
25	How long is DCC planning on sustaining the St Clair sea wall?	One	St Clair	DCC	The St Clair Esplanade is a very important space and we fully appreciate that the sea wall faces a range of challenges. The long-term planning piece of work that we are beginning this year will help build a better understanding of our options for managing this area over the short, medium and long-term.
26	Are we addressing worst case scenario sea level rise (i.e. more than 178cm by 2100?)	One	Climate Change	DCC/GNS	DCC: At this point in time the DCC has not made a decision on what scenario of sea level rise over what timeframe will be used for modelling adaptation options for South Dunedin. However, we fully appreciate that it is important to plan for the worst and to help communities understand how these changes might affect them. GNS: The NZSeaRise programme will produce a range of sea level scenarios for the Dunedin Coastline to at least 2100. The programme will use the latest global projections from IPCC to generate models for local New Zealand situations - these differ depending on both climate (e.g. air pressure), water temperature and tectonic (land uplift/subsidence) conditions.
27	When will the Council tell the truth about climate change?	One	Climate Change	DCC	Scientific evidence is clear that earth's climate is changing, mostly due to emissions of greenhouse gases from human activities such as burning fossil fuels. An increased concentration of these greenhouse gases in the atmosphere causes the Earth to heat more, the climate to change and sea levels to rise. Information from the Parliamentary Commissioner for the Environment shows that the mean average sea level has risen about 200mm since the beginning of the 20th century and is projected to rise another 300mm between 2015 and 2065. Climate change predictions and data will always change, however, and we will respond appropriately as new information becomes available.
28	What is the impact of sea level rise on potential solutions?	One	Climate Change	DCC	As sea level rise is one of the key issues for South Dunedin into the future, the DCC will be working alongside the community to develop potential solutions that protect against this. So rather than sea level rise having an impact on solutions, it will be what solutions can we all work to develop that will protect against the impact of sea level rise.
29	How are we preparing for changing rainfall/precipitation patterns?	One	Climate Change	DCC	All of this work is about preparing for and adapting to the effects of climate change - including more frequent intense rainfall events and rising sea levels. We've invested in infrastructure improvements, and we've got plans to invest much more.
30	How will consistency with other parts of NZ be achieved?	One	Climate Change	DCC	Every city/town/area in New Zealand has unique challenges, including those resulting from climate change. The DCC believes South Dunedin's challenges require locally-driven solutions, however we are also committed to ensuring consistency wherever possible - for example, in hazard mapping techniques.
31	How does local work relate to what is being done at a national level?	One	Climate Change	DCC/GNS	DCC: At the moment, central government is heavily focused on climate change mitigation (i.e. reducing emissions), rather than climate change adaptation. The DCC has been advocating for central government to work more with councils on adaptation, and any work being done now will help inform central Government thinking. GNS: The Ministry of Business Innovation and Employment (MBIE) is funding the NZSeaRise programme which involves a number of organisations including Victoria University, GNS Science and the ORC and some case studies, of which Dunedin is one. The programme is looking at global sea level rise and what it means for NZ coast and will be producing a range of local sea level change predictions.
32	Where is the urban renewal?	One	General	DCC	Urban renewal has not begun but will be a key principle of adaptation work that is being planned for South Dunedin.

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33	Is there any legal action we can take to stop insurers pulling out of South Dunedin?	One	General	?	We don't know the answer to this question.
34	How long will insurance companies stick around for?	One	General	?	We don't know the answer to this question.
35	Timeline for the water mitigation options?	One	General	DCC	Timelines for the various wastewater and stormwater options are outlined below. For the temporary wastewater diversion, timeframes will depend on the design of the overflow and what level of treatment it will receive before discharge. We intend to apply for resource consent for the temporary Kaikorai Valley wastewater diversion within the next six months. If resource consent is approved, it will take about six to nine months to complete the design and engage a contractor, and a further six to nine months to construct. Construction of the permanent pipe from Kaikorai Valley to Green Island is expected to start in 2023. Preliminary work and design of the Green Island Wastewater Treatment Plant is likely to take two years, with construction to start in 2024 and take about two years to complete. $35m is a budgeted for flood reduction in South Dunedin over the next 10 years. It is likely the next three to four years will be focused on planning, design and research, to determine how this money could best be spent. In the short term, we've identified some opportunities to remove bottlenecks from our stormwater network at Forbury Road and Portobello Road. Addressing these has the potential to significantly improve the stormwater system in South Dunedin. We're in the process of further investigation of these, with work potentially taking place from 2021.
36	Why is my section (Fingall St) sinking?	One	General	DCC	Unsure. Anyone with specific requests about their property should contact the DCC directly on 03 477 4000 to talk to one of our staff.
37	How often do they empty the mud tanks in SD?	One	General	DCC	Most mudtanks in South Dunedin get cleaned in an approximately 3 – 6 months cycle, some priority mudanks (eg. Forbury Rd – Macandrew Bay Rd intersection) are cleaned on monthly basis. Any mudtank identified as not meeting criteria are cleaned within one week. Priority mudtanks are required to be cleaned within 48 hours.
38	Is there any way to predict a timeline of future flooding?	One	General	DCC	While it is hard to predict exactly how often we will have heavy rain events, we are getting a better picture about where it might flood and what actions we can take to mitigate against that. The MetService has announced that it will install a rain radar for Dunedin - this will be a further tool to make sure we are better prepared and in turn more resilient to the effects of heavy rain.
39	How often do you think this will happen? (interpretation: how often will SD flood?)	One	General	DCC	See answer above (#38)
40	What thought is being put into preventing future sinkholes?	One	General	DCC	We are working with ORC and GNS to better understand the geology of the South Dunedin area.
41	How do we know it's flooding? Urgent situation? (interpretation: how do people know that it is flooding if they have disabilities or mobility needs that stop them accessing information the usual way?)	One	General	DCC	Getting connected with people around you is critical in ensuring a resilient community and the best time to build those connections is now. In emergency situations, we encourage people to check on neighbours and share official messages and notifications, especially to those who may be more vulnerable or have disability/accessibility challenges. Heavy and persistent rain can cause localised flooding.
42	What are the recovery plans for residents in Surrey St (and surrounding streets) in the short term?	One	General	DCC	We have fitted new backflow prevention valves to help stop wastewater getting inside homes in this area at risk. The temporary wastewater diversion at Kaikorai Valley will also significantly reduce the risk of wastewater flooding in Surrey Street and surrounding areas.
43	Is money the only driver/deciding factor	One	General	DCC	No. Councils are responsible for promoting the social, economic, environmental and cultural well-being of their communities. These factors will be considered alongside costs.
44	At what point in time will we know what the plan/preferred option is?	One	General	DCC	The DCC will involve the community in climate change adaptation work. The community and key stakeholders will be crucial to the work to form options for South Dunedin. The community will help decide a preferred option/plan as it is pieced together.
45	New subdivisions on hills - where does runoff, sewage etc go to, Green Island or Tahuna?	One	General	DCC	It depends what area you are referring to. Currently, wastewater from the greater Dunedin area is piped to Tahuna for treatment. Wastewater from Burnside through to Brighton is treated at Green Island. Most of the rain that falls on the hillside suburbs surrounding South Dunedin must flow through South Dunedin to reach the sea. This means that South Dunedin has to cope with surface water from a much wider area running off streets and through the stormwater network.
46	We appreciate that much of these water solutions are long term processes; however it would be helpful to have some smaller milestones to report.	One	General	DCC	We agree. In the shorter term, we have identified some opportunities to remove bottlenecks from our stormwater network at Forbury Road and Portobello Road. Addressing these has the potential to further improve the stormwater system in South Dunedin.
47	Could you share relevant examples of what other cities around the world are doing to address similar issues?	One	General	DCC	Many cities around the globe have begun using an approach called "blue-green infrastructure", where infrastructure like pipes and pumps are replaced or supplemented by natural approaches such as gardens, ponds and trees to manage water, heat and provide coastal protection. It is proving worldwide to not only be just as effective as traditional infrastructure in certain areas, but more cost effective.
48	What are we learning from experiences of other communities both here (nationally) and globally?	One	General	DCC	The DCC draws on international best practice. Some world leaders in climate change adaptation that we're following closely include Copenhagen (Denmark), Melbourne (Australia) and Rotterdam (Netherlands).
49	What modelling is being done?	One	General	DCC	Currently GNS and ORC are collecting groundwater data so that a model of the groundwater behaviour in South Dunedin can be prepared. The DCC will shortly be gathering additional data about flows in our water and wastewater pipes in South Dunedin so that we can improve the accuracy of our existing models. As part of this, we will use the groundwater data to further improve the accuracy of our piped network models. We can then start testing and assessing large scale options for flood alleviation in South Dunedin. These models will also take into account future climate change projections and their impacts on sea level rise and rainfall intensity.
50	What can be done to speed up the understandably slow consultation process?	One	General	DCC	As there is no 'silver bullet' for responding and adapting to the effects of climate change, community engagement on these issues will be an ongoing and iterative process. During this first stage of engagement, the focus is on raising awareness of what climate change impacts are expected and what this means for South Dunedin; what we are doing in the short term; and what individuals, households and communities can do themselves. We're keen to hear from you about the things that are important to you, where you think the information gaps are, and how you would prefer for us to keep in touch. We want to establish close working relationships with the South Dunedin community to help build a platform for future decision making. However, long-term adaptive planning work will take several years to complete, and the community conversation will be ongoing.

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51	Can people recreationally access the beach? If you have physical impairment how easy is it to access the beach?	One	General	DCC	St Clair, Middle and St Kilda beaches are not as accessible as they could be. The two most likely access points are: via the surf club ramp at the eastern-end of the sea wall and the access track along side the St Kilda Surf Club - however, neither are currently suitable for wheelchairs. We appreciate the need to improve accessibility to the beach and will look for opportunities to do so.
52	Will the cycleway connect South Dn with City Centre?	One	General	DCC	Yes, the 'Our Streets' Project will involve marking cycle lanes along Forbury Rd, South Rd, Hillside Rd, Orari St and Musselburgh Rise. More information about the project is on the DCC website at www.dunedin.govt.nz/ourstreets
53	Could South Dunedin cope with another flood like the 2015 one?	Two	Future predictions	DCC	We have made infrastructure and emergency response improvements that mean the city (and the community) is better prepared than in 2015. However, it is likely that significant flooding would still occur if exactly the same event happened again. In 2015, some of our infrastructure wasn't working as well as it should have. Specifically, the Portobello Pumping Station screens blocked, which meant the pumps worked below capacity. This made the flooding worse. In addition, and to a lesser extent, mudtanks were blocked. However, the rainfall in June 2015 was among the heaviest at Musselburgh since records began in 1919. With the amount of water, significant flooding was inevitable even if the system had been running perfectly. Since then, we have provided new infrastructure and improved maintenance to ensure the existing stormwater system works as well as it can. Specifically, we have installed a new, larger filter screen at the Portobello Road pumping station, for faster and more effective pumping; improved inspection, cleaning and maintenance for the 1500 mud tanks in South Dunedin and others across the city; and fitted new backflow prevention valves to help stop wastewater getting inside homes at risk. While systems coped well with significant rain events in July 2017 and again in February 2018, we haven't seen the same volume/intensity of rain as 2015.
54	If the 2015 weather event happened again what/how would emergency response cope?	Two	Future predictions	DCC	We have made improvements to our emergency preparedness and response procedures since 2015. This includes things like more proactive maintenance such as sweeping of gutters when there's a heavy rain warning and additional checks of mud tanks in high risk areas; as well as more sandbags, door-knocking and information centres during an event. We have also built up the capability of our incident management team.
55	If the 2015 weather event happened again how would the current infrastructure cope?	Two	Future predictions	DCC	See above (#53)
56	How often in future are events like 2015 likely to happen?	Two	Future predictions	DCC	It is difficult to predict. The low-lying nature of South Dunedin along with high groundwater levels and the effects of climate change makes the area more prone to flooding. The most immediate risk and potential impact is from significant rainfall events. This can produce more stormwater run-off than the existing stormwater system can cope with. In the medium to long term, rising mean sea level (and thus rising groundwater) will further increase the risk and potential impact to South Dunedin. Rising groundwater will lead to surface ponding in some places and more extensive flooding after heavy rain. It will also damage roads, pipes, and cables, as well as the foundations of buildings, particularly if the groundwater becomes saline.
57	How much has sea level rise been researched? - is it trending up or down? how much rise has already been seen?	Two	Future predictions	DCC	We draw from information provided by government, including from the Parliamentary Commissioner for the Environment. This information shows that the mean average sea level has risen about 200mm since the beginning of the 20th century and is projected to rise another 300mm between 2015 and 2065.
58	What form will this (regular community updates, engagement) take?	Two	Communication/publication of info	DCC	We will soon be contacting all known community groups and organisations, schools, sports clubs etc. in the wider South Dunedin area, and offering to meet with them individually and face-to-face to provide information on these issues. The focus during this first stage of engagement will be on raising awareness of what climate change impacts are expected and what this means for South Dunedin; what we are doing in the short term; and what individuals, households and communities can do themselves. While this is the first opportunity to talk about the effects of climate change on South Dunedin, it certainly won't be the last.
59	Once you have the analysis, what happens next?	Two	Communication/publication of info	DCC	The initial analysis will provide infrastructure teams the data they need to begin the flood alleviation work. The analysis will be ongoing and will inform longer term climate change work, such as adaptation options.
60	If there was better resourcing, could this happen better/quicker? Is research being held back by lack of resources?	Two	Communication/publication of info	DCC	Not necessarily. The cost of research is relatively modest in comparison to major infrastructure work. For example, the total cost of the groundwater research project being undertaken by DCC, ORC, GNS and others is about $50,000, while about $86 million has been budgeted for infrastructure projects over the next 10 years to reduce wastewater and stormwater flooding in South Dunedin.
61	I want to know ground level water and salinity over the Sth Dn area especially Hargest Cresc to sea level shore, when will it be available?	Two	Communication/publication of info	GNS	Note that groundwater levels and salinity all vary with time. There is a piezometer in Kennedy Street that has a tidal signature (i.e. groundwater levels vary with the tides see https://www.orc.govt.nz/managing-our-environment/water/water-monitoring-and-alerts/dunedin/kennedy-st) and the groundwater here was about 80% sea water in Feb 2019. There is also a piezometer at Alma Street and the water level is about 60 cm below ground level in June 2019. Some data are available in 'real-time', whereas other sites are downloaded every two or three months. Data can be obtained on request through ORC and/or GNS Science.
62	Can we access these powerpoints anywhere?	Two	Communication/publication of info	DCC	Yes, the powerpoint shown at the hui on 12 August is available on the DCC website at www.dunedin.govt.nz/council/council-projects/south-dunedin-future/news-and-resources. More information about the South Dunedin Future project to effectively respond and adapt to climate change is available at www.dunedin.govt.nz/southdunedin.
63	When will data be made public?	Two	Communication/publication of info	ORC	Most of the data captured by the Otago Regional Council is publicly available. Some of the water levels (including groundwater), river flows and rainfall data is available in real-time on the ORC Water Info website (https://www.orc.govt.nz/managing-our-environment/water/water-monitoring-and-alerts). We also have some data, including the most recent piezometer data, is available on request. The data is usually available as soon it has been quality checked.
64	Can these research presentations be translated into plain english?	Two	Communication/publication of info	DCC/GNS	DCC: We are very aware of the need to use as much plan English as possible when talking about these issues. We will be talking individually with and face-to-face with community groups so questions to be asked and answered on the spot as much as possible. GNS: Notes have been added to slides that were presented at the hui.

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65	When is the widening of the pipes going to occur or is it just a consideration?	Two	Infrastructure	DCC	At this stage, all options remain on the table. Widening is one of many options. Others might include basins to store floodwater, open channel "canals", making roads act as overland flowpaths, to name a few. There could be combinations of options. We need to take some time to figure out what a cost effective approach is and which options it will involve. In the meantime we've identified some opportunities to remove bottlenecks from our stormwater network at Forbury Road and Portobello Road. Addressing these has the potential to further improve the stormwater system in South Dunedin. We're in the process of further investigation of these.
66	Consultation with Christchurch re: liquefaction & the red zone process - is it worth it or is the future already set?	Two	Infrastructure	DCC	Climate change will affect us all during our lifetimes. The impacts we observe today are the result of historical emissions, and the increase in emissions in recent decades will lead to significant change in the coming years. However, through emission reduction we can help prevent the worst from occurring. The DCC will draw on best practice from councils around New Zealand and the world.
67	Is there any benefit to considering flood protection channels (like canals) at surface level to make water flow faster? (so flooding doesn't go up over kerbs) into garages and houses)	Two	Infrastructure	DCC	Again, at this stage, all options remain on the table, including both potential widespread solutions and smaller, micro-adaptation options.
68	Why didn't you drill as deep as you thought you would?	Two	Science and Data	GNS	We encountered volcanic rock and/or Caversham Sandstone at a much shallower depth than expected in the first two holes. We then decided to drill a third and also found volcanic rock at shallow depth. The volcanic rock or Caversham Sandstone was our bedrock target. The drill program was designed to obtain as much information as possible from the softer sediment layers that overlay the bedrock. In particular we want to understand the age, strength, absorbency, and formation history of this sediment across South Dunedin.
69	Why is it good for groundwater if the bedrock is shallow?	Two	Science and Data	GNS	The bedrock is very likely to be less absorbent to groundwater (and sea water incursion) than the soft sediment lying on top of it. Having a thin layer of sediment, rather than a thick basin fill, may mean there is less total volume of groundwater and less (or slower) hydraulic connection to water-bearing rock and springs in the surrounding hills. It MAY mean that it is easier to find engineering solutions to decreasing the groundwater levels, such as by pumping or subsurface drainage. The detailed modelling of groundwater is only just beginning (as at Aug 2019) now that we have drilling information and better monitoring data of groundwater level fluctuations (e.g. due to tides, rainfall).
70	What is the groundwater impact of the 1,000,000 and of gasworks tar located across the road in the ground from the warehouse?	Two	Science and Data	?	We don't know the answer to this question
71	What is the quality of the groundwater?	Two	Science and Data	GNS	In a project with Otago University Geography Department we have been sampling groundwater every two months, and measuring water electrical conductivity (saltiness), pH and temperature regularly. Chemical analyses can tell us the origin of the water beneath the ground, and the mixing of different sources such as sea water versus rainwater. To date, we have found that the conductivity (saltiness) is high close to the beach and the harbour due to seepage of sea level. Samples have also been collected to test for E.coli, and other potential contaminants, so far, it's fair to say there have been no major alarm bells or unexpected results from the piezometer monitoring sites tested. The first results indicate groundwater is mostly a mixture of either rainwater, old rainwater that has reacted with sediments, or seawater. The mix varies in differing proportions across South Dunedin, with greater quantities of sea water near the Harbour and beaches.
72	Question to Phil Glassey & GNS - contaminated sites all over gas and industrial area: containment? mitigation?	Two	Science and Data	GNS	Although there are some areas (such as the old gasworks) that have been listed as 'contaminated' by the DCC, we have no data or observations as to the actual degree of contamination or concern, nor any real understanding as to why they were deemed as such. Monitoring sites installed in 2019, were chosen principally for understanding groundwater level (quantity) rather than quality. Being pragmatic - it was simpler to select and obtain sites that avoided areas that may have underground services, overhead wires or potential contamination - and we found a satisfactory distribution using roadside reserves and parks. GNS Science does have a groundwater research programme and a component of that is focussing on Urban Groundwater, however environmental contamination and remediation is not a speciality of Phil Glassey and the Dunedin Office has limited capability in this area.
73	Is the Green Is sea level recorder part of a global network like the Port Chalmers one?	Two	Science and Data	ORC	The Green Island sea level recorder is not part of the Global Sea Level Observing System (GLOSS, https://www.gloss-sealevel.org/), neither is Port Chalmers (but Bluff is). The Green Island recorder data, after quality checking, is however supplied by NIWA to the Permanent Service for Mean Sea Level (PSMSL, https://www.psmsl.org/), a global data bank for long term sea level change information from tide gauges based at the National Oceanography Centre in Liverpool (UK). Land Information NZ also send Dunedin Wharf and Port Chalmers data to the same data bank.
74	How far does the tidal influence go? Does it go as far as Macandrew Rd?	Two	Science and Data	GNS	Presently we only see clear tidal influence in the Kennedy St bore (near St Clair School) and see little (if any) tidal influence at Macandrew Road. The tidal shift in Kennedy Street groundwater is about 20-30 cm - so about 12-25% of the ocean's tidal shift - and it decreases quickly as you move away from the ocean. However, the tidal influence also depends on the groundwater level - so we expect to see some sites that will have small (<10cm) tides during periods when groundwater levels are low (summer-autumn) and no tides at times of high groundwater (winter-spring).
75	Why have they put the drills where they are and why are there gaps in some areas?	Two	Science and Data	GNS	There were a number of factors in siting the drill holes. 1) We have placed drill holes and groundwater level instruments on DCC reserve land so we did not have to negotiate access to drill and maintain the instruments. 2) We chose sites where pre-existing but unreliable estimates of bedrock were a maximum. 3) Where, at a later stage, we could carry out pump testing of the aquifer and have nearby existing shallow piezometers as water level monitoring sites 4) To avoid the hazard zone around the old gas works which would have required resource consent and additional health and safety requirements 5) Where we could match drill hole and Cone Penetrometer Test data

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76	What trends have they noticed?	Two	Science and Data	GNS	Compared with open gravel aquifers (e.g. Canterbury) the groundwater levels in the silty-sand estuarine land of South Dunedin are much more constant. The monitoring network installed in early 2019 is operating well, but we have <6 months worth of data at many sites, and are aiming to understand both seasonal (autumn-winter-spring-summer) and inter-annual variability from one year to the next (e.g. due to La Nina/El Nino conditions). The groundwater level is generally close to the surface (in many places <1 metre) but varies across South Dunedin and clearly responds to rainfall. For every 1 mm of rainfall we tend to get between 5-10mm of groundwater rise - because the rain only has to percolate down and infill the air (pore) spaces in the sediment. We have found that the conductivity (saltiness) is high, close to the beach and the harbour.
77	What is the relevance and correlation of the hills water flow on as well as the sea?	Two	Science and Data	DCC	Most of the rain that falls on the hillside suburbs surrounding the area must flow through South Dunedin to reach the sea. This means that South Dunedin has to cope with additional surface water running off streets and through the stormwater network from a much wider area. This water falling on the hills also affects the behaviour of groundwater in South Dunedin. The work being done by GNS and ORC aims to better understand the relevance and correlation of water flows from hills and the sea.
78	Would a lower groundwater level have prevented the 2015 flood?	Two	Science and Data	DCC	Even with a lower groundwater level it is estimated that the 2015 flood would still have occurred, though it is likely that it would have been less severe.
79	Why has the sea risen as much? Is it because of the ground/earthquakes?	Two	Science and Data	GNS	Sea-level varies depending on whether the earth is in a glacial period, or an interglacial period. We are currently in an interglacial period. In a glacial period, sea level is much lower than present as sea water is locked up as ice at the poles, in glaciers and ice sheets. Sea-level also varies due to temperature of the sea water, and the force of gravity, which is not constant over the globe. The vertical movement of the land (up or down) due to earthquakes also affects sea-level with respect to the land.
80	Will the new data change the 'big picture'?	Two	Science and Data	DCC	As well as giving us a better understanding of what's going on now, the testing will help develop better computer models of the impacts of future storms and sea level rise. This in turn lets us better understand options to mitigate against and adapt to these effects in future.
81	What is the relationship between this information and risk assessment?	Two	Science and Data	DCC	With solid scientific data, we can make better decisions on how to reduce risk. As well as giving us a better understanding of what's going on now, the testing will help develop better computer models of the impacts of future storms and sea level rise. This in turn lets us better understand options to mitigate against and adapt to these effects in future. The information will also be useful in preparing for an imminent flood, as response agencies will have a better idea of how much capacity the ground has to hold rainwater at any given time.
82	Is there a plan to do more exploration and see if there is a deeper bedrock than 50m (the riverbed)	Two	Science and Data	GNS	At present, no. The drilling might enable better interpretation of seismic profiles carried out by University of Otago and allow us to get a better indication of where the sediment may be deeper. Once this is done, we will decide what further investigations are needed.
83	How would the alpine fault rupturing affect South Dunedin?	Two	Science and Data	GNS	An Alpine Fault rupture will certainly be felt in Dunedin, producing a long (minutes) period of shaking and a subsequent swarm of aftershocks. But because of our distance from the fault, the level of shaking is not expected to cause large amounts of damage in the city. Instead, it is the expectation that Dunedin will need to be a Civil Defence centre that will help support other areas - such as the West Coast, Queenstown, Wanaka and Milford. The AF8 website has a lot of really great resources including video resources that show a modelling of what the fault rupture might look like when it ruptures: https://af8.org.nz/
84	What do they currently know about liquefaction in South Dunedin?	Two	Science and Data	GNS	Only that South Dunedin is underlain by 1) young, weak, sands and silts and 2) shallow groundwater - so it has prerequisites suggesting it is susceptible to liquefaction. Liquefaction hazard susceptibility was mapped in a review for ORC/DCC in 2014, however cone penetrometer tests carried out by QuakeCore/EQC in February 2019 and other existing data have yet to be fully analysed to quantify exact liquefaction potential.
85	Rock is a lot shallower... What does that mean for liquefaction?	Two	Science and Data	GNS	Bedrock was encountered in the drilholes at depths of between 13.5 to 18 m below the surface. Liquefaction can occur in sediment up to 15m below the surface and the sediment encountered in the drill holes has the potential to liquefy. Hence susceptibility to liquefaction has not changed as result of the drilling outcome. Having a thinner layer of soft-sediment material would generally mean lower potential for seismic waves and shaking to be amplified in the near-surface, which may mean slightly lower potential for liquefaction. But it is unlikely that the difference would be significant enough, nor well-understood enough at this stage, to change any requirements of the building code (e.g. for foundation design).
86	What other areas in Otago are at risk from climate change? Are there any in Central Otago?	Two	Science and Data	ORC	Climate change can affect all parts of Otago, including Central Otago. ORC is completing a Climate Change Risk Assessment for all of Otago over the next year to gain a better understanding of what the risks and opportunities are for the entire region. We're looking at many different aspects including; changes in temperature, wind, rain, snowfall along with vulnerabilities for industry sectors and communities. This will help our local councils, communities and industry to better prepare and adapt to what the future might bring.
87	What are the plans for the areas with the highest groundwater levels? Will they be evacuated first? Or more infrastructure (i.e. pumps)	Two	Science and Data	DCC	Our current focus is on short term interventions which will alleviate flooding, while developing a forward-looking programme for adapting to the medium to longer term climate-driven challenges facing South Dunedin. We will also look at opportunities to improve housing and amenity as part of developing a resilient, healthy and liveable South Dunedin. Along with the ORC, GNS and others, we are currently collecting groundwater and other technical data to help inform what the longer-term adaptation options and pathways may be.
88	As good as it may be to know specifically how much sea levels are rising, would we not assume that they are going to keep rising regardless? Therefore should we not be assuming the worst?	Two	Science and Data	DCC	As a local authority we draw from information provided by government, such as information from the Parliamentary Commissioner for the Environment. This information shows that the mean average sea level has risen about 200mm since the beginning of the 20th century and is projected to rise another 300mm between 2015 and 2065.
89	Where is Veggie Boys going to go?	Three	Hub and library site	DCC	This joint statement was provided to the Otago Daily Times on 9 August 2019 and published the following week: "Veggie Boys had a long term lease and was given the option to stay for the remainder of the lease or agree exit terms. Veggie Boys chose to enter into a voluntary agreement which included a reasonable payment intended to offset relocation costs if that proved possible. - Dr Sue Bidrose (Chief Executive Officer, Dunedin City Council) and Marty Hay (Director of Veggie Boys Limited)".
90	Why did you choose to force out one of the strongest businesses in South Dunedin?	Three	Hub and library site	DCC	See above (#89)
91	Why not the United Video Site?	Three	Hub and library site	DCC	The property had already been sold and planning for a development was underway when the South Dunedin Library and Community Complex Project review of sites started in the 2018/19 financial year. (Project funding was allocated in the 2019/20 and 2020/21 financial years)

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92	Will the pop-up library staff be retained?	Three	Hub and library site	DCC	The South Dunedin Community Pop-up staff have permanent roles in library services in South Dunedin.
93	Are you going to keep funding the pop-up hub?	Three	Hub and library site	DCC	The lease for the South Dunedin Community Pop-Up is being extended so the library and other services can continue while the permanent facility is developed.
94	Sureley easier to ask for feedback for a design rather than have people involved the whole way through?	Three	Hub and library process	DCC	We want to design the facility with the community to achieve the best outcome. To do this the DCC is planning a different approach to community engagement for this project by including a community co-design process. Co-design is frequently used in the design of community facilities and services nationally and internationally. Co–design will occur in the first two stages of the four-stage design process. The objective is to ensure the facility meets the needs of the community, supports ongoing utilisation and achieves identified community wellbeing outcomes for the project.
95	Who are you codesigning with? Including diversity of community including disabled people	Three	Hub and library process	DCC	Co-design panel participants will be identified from stakeholder groups representing sectors of the South Dunedin community including disability advocacy and support, older people, youth, migrant and refugee communities, Pasifika, Mana Whenua, residents, local businesses and support agencies.
96	Cost/benefit analysis of having a green star?	Three	Hub and library sustainability	DCC	One of the key benefits of having a Greenstar rating is that it provides independent verification that sustainability has been considered from the perspective of multiple elements and integrated into a project. Benefits of green building include improved occupant wellbeing and health, improved energy efficiency, reduced greenhouse gas emissions, reduced operating costs and improved waste management during construction phase, to name a few. The perception that green building adds disproportionate costs to a project is not always correct, particularly if the 'whole of life' building cost are considered. A decision to go with Greenstar on this project has not been made yet. We will be developing cost estimates as we progress the design and will be taking a holistic view.
97	Sustainability? How? Financial?	Three	Hub and library sustainability	DCC	Sustainability is a key focus for this project. We are considering sustainability not just in the financial sense, but also from a social, cultural and environmental perspective. This offers a broader view demonstrating greater investment value.
98	Would new build be cheaper than refurbishing?	Three	Hub and library sustainability	DCC	A quantity surveyor will be undertaking cost estimates as we progress with design options. This information will inform decision making.
99	How will the design consider sea level rise and increased flood events?	Three	Hub and library sustainability	DCC	We will be considering this question carefully as design ideas develop.
100	What is the proposed lifespan of the library and how is it being built to adapt to climate change impacts?	Three	Hub and library sustainability	DCC	Under the building code the life of a building should be not less than 50 years. This is the minimum requirement. Questions around climate change impacts and effective design are being considered in planning.
101	Does it float - socio-ecologically sustainable? We should lead the way	Three	Hub and library sustainability	DCC	The building won't float, but yes, we are thinking socio-ecologically sustainable as discussed above.
102	Is it going to be as good as the one in Christchurch? E.g. lots of space, kids play area, roof top gardens, lockers and interactive displays?	Three	Hub and library sustainability	DCC	We are planning a facility that includes design and scope elements associated with modern library and community centre developments. As we work with the community through the co-design process this will inform the scope for the project. The new central library in Christchurch is certainly providing inspiration for this project, however the two projects are very different in scale, a branch library vs a central library. (The Central library in Christchurch is the largest public library in the South Island, cost $92 million to build and requires an annual operating budget of $7 million).